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CURING: THE EASIEST AND CHEAPEST METHOD TO INCREASE THE DURABILITY AND STRENGTH OF CONCRETE

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Abstract. *Curing is a process which follows immediately after placing and finishing of concrete. It maintains a satisfactory moisture content and temperature in concrete for a period of time so that the desired properties may develop. Curing has a strong influence on the properties of hardened concrete. With proper curing concrete becomes stronger, more impermeable, and more resistant to stress, abrasion, and freezing and thawing. Using of fiber in concrete may improve these properties but it increases the cost of concrete. This paper reports the results of a study conducted to assess the effect of ages of curing on durability and strength of fiber and non fiber reinforced concrete. Also a comparative study of cost per unit strength and cost per unit service life period is done in between fiber reinforced concrete and non fiber reinforced concrete with proper curing. The concrete cubes were prepared by varying three water cement ratios and by curing them for a different number of curing days. Bulk electrical resistivity test, ultrasonic pulse velocity test, compressive strength test, flexural strength test and carbonation depth test of the cured cubes were performed. From the test results it is found that proper curing of traditional concrete is more economical than fiber reinforced concrete in achieving the same strength and durability.*

Key Words: *Curing, Durability, Strength, Life Cycle Cost*.

1. INTRODUCTION

Curing of concrete maintains a satisfactory moisture content and temperature in concrete during its early stage for release of heat of hydration and continuation of hydration reaction. It plays a major role in developing a good micro structure of concrete by increasing its durability and strength. Various researchers have reported that initial wet curing time is important for concrete quality development. An initial curing of 7 days was found more beneficial for the strength development of light weight concrete [Haque (2007)]. However, the initial curing period should be extended to 14 days when cement is partially replaced with supplementary cementitious materials [Bonavetti V. et.al.(2000)]. This is due to the

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slow hydration reactions between supplementary cementitious materials and the calcium hydroxide [Al-Gahtani(2010)]. When water is added to Portland cement a chemical reaction called hydration takes place. The completion of hydration process influences the strength and durability of the concrete [I.G. Richardson (1999), Mannan et.al. (2002), Tasdemir (2003), Oritz et.al. (2005), McCartera and Ben-Salehb(2001)]. Degree of hydration, as well as the age of curing, exposure to aggressive environment, etc., also affects the strength and pore system of concrete [Rakesh Kumar and B. Bhattacharjee (2003)]. Freshly mixed concrete normally contains more water than is required for hydration of the cement, but due to evaporation excessive loss of water can delay or prevent the entire hydration process. Some researchers investigated compressive strength development, sorptivity, carbonation depth and the chloride permeability of concrete cured both in air and in water [Bai et.al. (2002), Duran (2005), Guneyisi and Gesoglu (2009)]. It is found that water-cured samples have higher compressive strength and sorptivity, lower carbonation depth and the chloride permeability than samples cured in air. The objective of curing is to provide an appropriate environmental condition within a concrete structure (temperature and humidity) to ensure the progress of hydration reactions causing the filling and segmentation of capillary voids by hydrated compounds [Guneyisi et.al. (2007)]. An important role of curing is to control the rate and extent of moisture loss from concrete during the cement hydration. With proper curing, concrete becomes stronger, more impermeable, and more resistant to stress, abrasion, and freezing and thawing.

The exact assessment of life time of a concrete structure from a given concrete mixture is very difficult. Many standard codes suggest prescriptive specifications, assuming that they will result in an appropriate durability. In the new European Standard EN206+A1, different exposure classes are defined and among them XC exposure classes deal with carbonation. I.S. 456 (2000) also classified levels of severity during the working life of concrete in five different environmental exposure conditions. Minimum binder content and maximum water binder ratio are also specified.

2. RESEARCH SIGNIFICANCE

Proper curing of concrete affects severely the properties of hardened concrete such as strength, permeability, abrasion resistance, resistance to freezing-thawing, resistance to carbonation and corrosion. Curing can be shown to have a marked effect on the hydration of cements as well as on its resistivity. Nowadays local contractors do not have the awareness about importance of proper curing of structure, hence for completion of task before time and for earning a good sum by saving on curing. Even if concrete is made with proper specifications, due to the lack of proper curing concrete fails to achieve the required strength and durability. Many people tried to show the importance of curing with the help of compressive strength and flexural strength. Very few researches were carried to understand the importance of curing with non destructive testing. In present study bulk electrical resistivity and ultra pulse velocity were measured at 7 days, 28 days, 56 days and 119 days on concrete cubes and hydration rate of six types of fiber and non fiber reinforced concrete mixes is observed. Also compressive strength and carbonation depth are found for the above curing days. Life time period of each mix is determined from electrical resistivity and carbonation depth. A comparative study of fiber and non fiber reinforced concrete was done for cost per unit strength and cost per unit time period (in years).

3. Materials and Methods

3.1. Materials

Cement: Locally available ordinary Portland Cement (OPC) 43 Grade was used in the present investigation. This Cement confirms all the requirements of the IS 12269-1987.

Sand: Sand was collected from Mahanadi River Basin and used as fine aggregate. By sieve analysis sand was confirmed in zone-II of IS-383 (1970) with the fineness modulus 2.67.

Aggregate: Locally available crushed stone of maximum size 10 mm was used as a coarse aggregate. The fineness modulus of coarse aggregate was 5.9. The volume of coarse aggregate per unit volume of total aggregate was taken as 0.5 based on the lab trials providing maximum vibrated bulk density.

Fiber: Glass fibers with constant volume of fraction i.e. 0.1% of total volume were used in the present investigation. This particular volume of fraction was optimized with shrinkage and slump characteristics. Addition of fiber decreases shrinkage and slump and reduction of slump could increase the voids hence optimum value of fiber dose was decided within limits of shrinkage and workability. The dose of fiber is fixed as 0.1% by volume on the basis of test results of trial mix which is shown in Table-1 (a). The length of fiber was 12 mm and diameter was 14 μm.

Super Plasticizer: A high range water reducing admixture was used. It is based on selected water soluble sulphonated polymers, each of which acts optimally on the various constituents of Portland cement. The dose of the super plasticizer was 0.75% of weight of cementitious materials and it was kept constant for every mix to maintain minimum slump of 25 mm.

3.2. Mix Proportions

The mix design was prepared using three water cement ratios such as 0.35, 0.4 and 0.45 with glass fiber and without glass fiber as shown in Table-1(b). Two types of concrete were prepared named as controlled concrete i.e. non fiber reinforced concrete and fiber reinforced concrete. The volumetric ratio of fine aggregate to coarse aggregate was 1:1 for maintaining the maximum density of combined aggregate. Lower slump was obtained, due to using of 10 mm size aggregate with addition of 0.1% of glass fiber. Hence super plasticizer was added to get minimum slump of 25 mm. Weighed quantity of coarse and fine aggregates were mixed thoroughly for about 1 minute in 0.04 m^3 capacity mixer and cement was added to this dry mix until a uniform colour was obtained. Measured quantity of water was added along with admixture of 0.75% of cementitious materials.

Table-1(a) Trial Mix Results of Shrinkage and Slump Height for Different Doses of Fiber

Dose of	Shrinkage (μm)			Slump Height (mm)		
Fiber (%)	w/c=0.35	w/c=0.4	w/c=0.45	w/c=0.35	w/c=0.4	w/c=0.45
0.000	256.42	308.85	372.16	36	41	51
0.025	215.67	273.56	318.45	35	39	48
0.050	182.65	225.73	265.23	32	37	45
0.075	135.13	179.07	218.96	28	34	40
0.100	110.26	135.80	160.03	25	29	35
0.125	75.93	95.34	110.65	21	25	30
0.150	40.56	55.45	65.84	17	20	25

Table-1(b) Mix Proportions of Concrete Containing Different Water Cement Ratios

Mix	w/c	Cement (kg/m^3)	Sand (kg/m^3)	Aggregate (kg/m^3)	Water (kg/m^3)	Admixture (kg/m^3)	Fiber (kg/m^3)	Slump (mm)
Non Fiber Reinforced Concrete								
C1	0.35	450	917	959	157	3.40	0	36
C2	0.4	413	914	956	165	3.10	0	41
C3	0.45	367	934	977	165	2.75	0	51
Fiber Reinforced Concrete								
F1	0.35	450	917	959	157	3.37	2.65	25
F2	0.4	413	914	956	165	3.10	2.65	29
F3	0.45	367	934	977	165	2.75	2.65	35

3.3. Casting and Testing Procedure

Cubes of 100 mm X 100 mm X 100 mm size of each concrete mixture were cast in two series for determining the bulk electrical resistivity, ultrasonic pulse velocity, compressive strength and carbonation depth. In series-1, 72 cubes were cast for Ultrasonic Pulse Velocity (UPV), Electrical Resistivity (ER) and Compressive Strength Test and other 18 cubes were cast in Series-2 to determine carbonation depth. The specimens were de-molded after 24 hours and were cured in water for 7, 28, 56 and 119 days. After curing for the stipulated period, the 72 cubes of Series-1 were taken out from the tank and tested for bulk electrical resistivity test followed by ultrasonic pulse velocity test. The results are given in Figure-2 and Figure-3.

(a) Electrical Resistivity Meter (b) Ultrasonic Pulse Velocity Test (c) Carbonation Chamber

Fig.1 Different Equipments for Checking Durability of Concrete

Table 2 Carbonation Depth (mm) for Non Fiber and Fiber Reinforced Concrete of Different w/c

Mix	C1	C2	C3	F1	F2	F3
Carbonation Depth (mm)	1.0	2.5	5.0	0.75	2.0	4.0

After that the cubes were kept in compressive testing machine to determine corresponding compressive strength of 7, 28, 56 and 119 days curing. Other 18 cubes of Series-2 were cured for 28 days in water and kept in the carbonation chamber for 28 days. The dose of carbon dioxide was kept at 5%, temperature 35^{0}C and 70% humidity. After the curing period the specimen was broken into two halves and 1% phenolphthalein solution was applied on the broken surface. After some time pink colour was seen in uncarbonated portion of concrete and no color change was observed in carbonated concrete. The carbonation depth was measured by using measuring scale and quoted in Table-2. In order to investigate the influence of curing on fiber and non fiber reinforced concrete flexural strength was tested on 72 beams of six different mixes. The beam specimens were cast in mould of size 100 mm X 100 mm X 500 mm according to prescription of IS 10086:1982. After casting they were allowed to harden at room temperature for 24 hours prior to demoulding and then cured in water for 28 days and 90 days before testing. After completion of required curing days, the beams were kept on flexural testing machine. The specimens were loaded to complete failure with a constant cross head speed and failure load is noted. Three specimens were tested at each testing age and their average flexural strength was calculated and tabulated as shown in Table-3.

Table 3 Flexural Strength (MPa) for Non Fiber and Fiber Reinforced Concrete of Different w/c

Mix		C1	C2	C3	F1	F2	F3
Flexural Strength	28 Days	3.15	2.55	2.0	4.45	3.60	2.75
(MPa)	90 Days	3.75	3.05	2.38	5.32	4.29	3.27

4. Result and Discussion

4.1. Electrical Resistivity Test

Bulk Electrical Resistivity test was conducted on 100 mm X 100mm X 100 mm cube at 7 days, 28 days, 56 days and 119 days. It is noticed that the electrical resistivity of each mix of fiber and non fiber reinforced concrete shows higher values for longer periods of curing. Electrical resistivity value of 28 days of curing is 40% more than 7 days of curing and it is near about double at 56 days of curing. At 119 days of curing ER value is 150% more than 7 days of curing and twice of 28 days of curing. Hence it is concluded that long age curing seals pores in concrete due to better hydration by forming a CSH gel and can be protected from chloride and carbon dioxide penetration. From Figure-2 it is seen that electrical resistivity values of 56 days plain concrete can be achieved at 28 days by adding 0.1% fiber. But addition of fiber increases the cost of concrete.

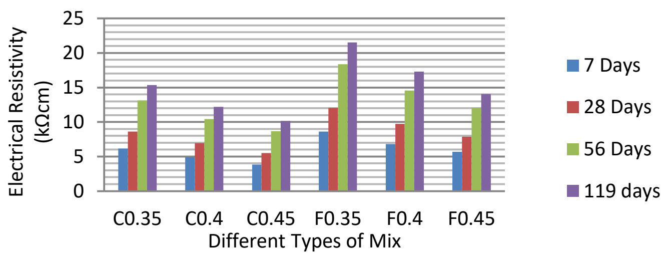

Fig. 2 Electrical Resistivity of Fiber and Non Fiber Reinforced Concrete for Different Curing Age

4.2. Ultrasonic Pulse Velocity Test

To assess the quality and homogeneity of cement concrete a UPV test was conducted for six different mixes as per guide lines of IS: 13311 (Part-1):1992. Since all the test results of UPV are more than or equal to 4.5 it is evident that all the test specimens fall under excellent category. The highest UPV value was shown on 119 days curing cubes and the lowest value on 7 days curing cubes. Hence it is concluded that a long term curing process will increase the UPV value of concrete. UPV values of fiber reinforced concrete is nearly about up to 3.0% higher than of non fiber reinforced concrete of the same water cement ratios.

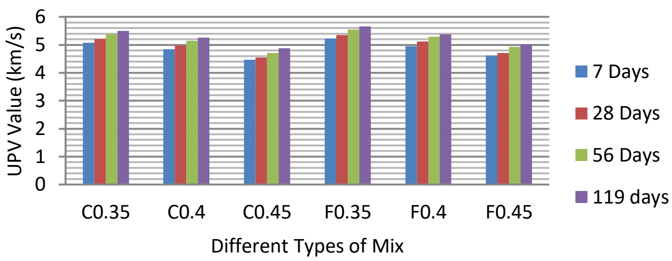

Fig. 3 UPV Values of Fiber and Non Fiber Reinforced Concrete for Different Curing Age

4.3. Carbonation Depth

The carbonation depths of different mixes at 28 days of water curing are shown in Table-4. The carbonation depth of fiber reinforced concrete is 20% - 25% higher than of non fiber reinforced concrete at same water cement ratio. Also the carbonation depth shows a low value at low water cement ratio, due to lower water voids. Carbonation depth of w/c= 0.35 is one fifth of the carbonation depth of w/c=0.45.

4.4. Compressive Strength Test

Compressive strength result of 7, 28, 56 and 119 days for six different mixes are plotted in Figure-4(a). It is seen that the compressive strength gradually increases as the curing period increases and water cement ratio decreases. The compressive strengths are 18%, 40% and 48% higher at corresponding curing of 28, 56 and 119 days than at 7 days curing. It is also noticed that compressive strength of F3 and C2 as well as F2 and C1 are neary about the same. Hence the compressive strength can be achieved at low water cement ratios by addition of fiber. Again the compressive strength of non fiber reinforced concrete at 28 days and 56 days curing shows nearer value with the compressive strength of fiber reinforced concrete at 7 days and 28 days of curing for all water cement ratios. Addition of fiber gives early strength to concrete but it increases the cost of construction. To achieve such strength by the curing process will be cheaper than by fiber reinforced concrete. Also it is seen that the UPV value increased in a parabolic way with increasing of compressive strength for any age of curing. A correlation between compressive strength vs UPV at 28 days of curing is shown in Figure-4(b).

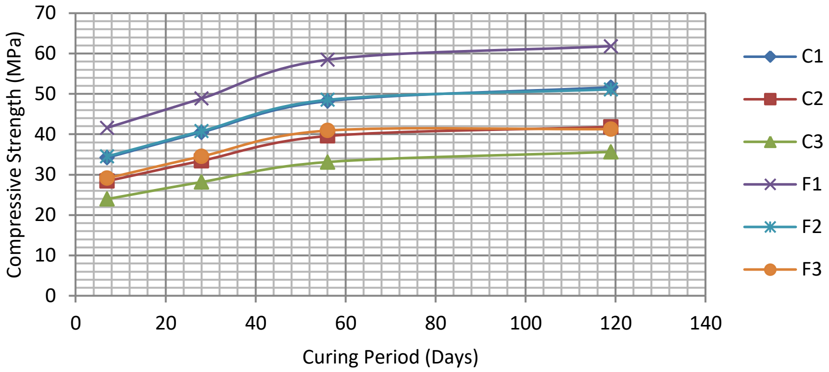

Fig. 4(a) Compressive Strength of Fiber and Non Fiber Reinforced Concrete for Different Curing Age

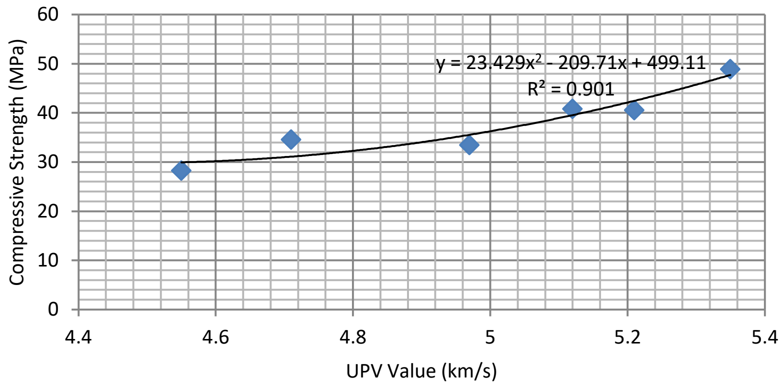

Fig. 4(b) Correlation between Compressive Strength and UPV value at 28 days of Curing Period

4.5. Flexural Strength Test

Test results of flexural strength for various curing days are tabulated in Table-5. It is seen that flexural strength of all mixes at 90 days of curing is about 20% more than flexural strength at 28 days of curing. When fiber is added the flexural strength increases about 40% w.r.t. of non fiber reinforced concrete with that corresponding water cement ratios. Flexural strength of non fiber reinforced concrete of 0.35 w/c at 28 days of curing (i.e. 3.15 MPa) is near about equal to flexural strength of fiber reinforced concrete of 0.45 w/c at 90 days of curing (i.e. 3.27 MPa). Hence it can be concluded that the flexural strength of non fiber reinforced concrete can be achieved to be equal to flexural strength of fiber reinforced concrete by prolonging water curing.

4.6. Dynamic Modulus of Elasticity

For designing the structure the designer requires not only compressive strength but also stiffness. The traditional method for computing the stiffness is by measuring dynamic modulus of elasticity. Nilsen and Aitcin (1992) established an equation for dynamic modulus of elasticity from compressive strength and ultrasonic pulse velocity test result as follows.

$$E_d = \gamma \ \ v^2 \frac{(1+\mu)(1-2\mu)}{(1-\mu)}$$

Where: *Ed* – Dynamic Modulus of Elasticity in *MPa*
γ – Density of Concrete in kg/m^3
v – Ultrasonic Pulse Velocity Value
μ – Poissons Ratio.

Table 4 Dynamic Modulus of Elasticity of Concrete of Different Mixes at 28 Days Curing

Mix	γ(kg/m^3)	v (km/s)	μ	f_c (MPa)	E_d (GPa)
C1	2400	5.21	0.2	40.51	58.63
C2	2400	4.97	0.2	33.45	53.35
C3	2400	4.55	0.2	28.18	44.71
F1	2400	5.35	0.2	48.86	61.82
F2	2400	5.12	0.2	40.28	56.62
F3	2400	4.71	0.2	34.93	47.91

It is noticed that the value of modulus of elasticity is higher for fiber reinforced concrete with low water cement ratios. The dynamic modulus of elasticity of fiber reinforced concrete is 5%, 6% and 7% higher than non fiber reinforced concrete at water cement ratios 0.35, 0.4 and 0.45 respectively at 28 days of curing. The addition of fiber increases the strength however at a higher cost. Figure-5 indicates that prolonged curing of concrete has increased the dynamic modulus of elasticity of concrete. It also indicates that a value higher than 28 days dynamic young’s modulus of elasticity of FRC could be achieved at 56 days of curing.

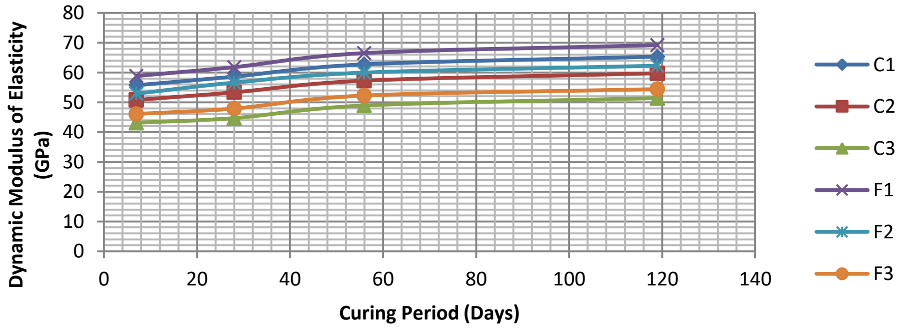

Fig. 5 Dynamic Modulus of Elasticity of Various Mixes of Concrete for Different Curing Age

4.7. Service Life Period

Carmen Andrade (2010), expressed following relation between electrical resistivity (ρ) and service life period (t) with cover depth (X) of structural member.

$$X = \sqrt{\frac{K}{\rho_0 \left(\frac{t_e}{t_0}\right)^q r}} \sqrt{t}$$

By using the above formula the service life period of six different mixes are determined. It is assumed that the type of exposer class is X_{c3} i.e. concrete surfaces subjected to water contact and environmental condition is cyclic wet and dry. According to EN206 coefficient of carbon dioxide permeability is 3000 Ωcm^3/year for cyclic wet and dry. But in carbonation chamber exposer condition is higher than environmental condition. Hence K value is considered as 5000 Ωcm^3/year. According to Bhargava and Banthia (2007), coefficient of permeability (K) for 0.1% volume of fraction of fiber reinforced concrete is approximately 0.57 times of plain concrete. Hence the value of K is taken as 2850 Ωcm^3/year for fiber reinforced concrete. Generally the clear cover of structural member is taken as 25 mm. Here the term X is taken as uncarbonated cover depth i.e. 25 mm - carbonation depth of concrete and tabulated in Table-7 for various mixes.

In this experiment following parametric values are taken for above formula

$X = Un$ Carbonated Cover Depth

$K =$ Coefficient of CarbonDioxide permeability

$= 5000 \ \Omega cm^3 / Year$ (non fiber reinforced concrete)

$= 2850 \ \Omega cm^3 / Year$ (fiber reinforced concrete)

$\rho_0 =$ Electrical resistivity at 28 days

$t_e = 10$ years

$t_0 = 28$ Days $= 0.0767$ Years

$q =$ Aging factor during 10 years $= 0.3$

$r =$ Cement binding factor $= 1.8$

$t =$ Life Time or Service Life Period

Table 5 Service Life Period of Various Mixes.

Mix	K(Ωcm^3/year)	ρ (kΩ cm)	r	CD (mm)	X (cm)	t (years)
C1	5000	8.61	1.8	1.0	2.9	112.37
C2	5000	6.94	1.8	2.5	2.75	81.44
C3	5000	5.51	1.8	5.0	2.5	53.44
F1	2850	12.05	1.8	0.75	2.92	280.69
F2	2850	9.73	1.8	2.0	2.8	207.69
F3	2850	7.89	1.8	4.0	2.6	145.21

4.8. Cost Benefit Analysis

To analyze the effect of curing on the cost of concrete, cost per unit strength of different curing periods is shown in Figure-6. It can be observed that the production cost of concrete for achieving compressive strength of 1 N/mm^2 shows a lower value for long age curing. From Figure-6 it is seen that the rate of decreasing cost is very high up to 56 days of curing. Beyond this cost per unit strength gradually increases. The cost per unit strength of concrete at 119 days of curing is slightly higher than at 56 days of curing. It happens because of cost of curing increases more as compared to increasing of compressive strength at higher age of curing period. Hence curing of structure for 56 days is recommended to local contractors. Also the best performance among the mixes on the basis of strength and durability at minimum cost, cost per unit strength and cost per unit service period at 119 days curing is tabulated in Table-8 (a) and 8 (b).

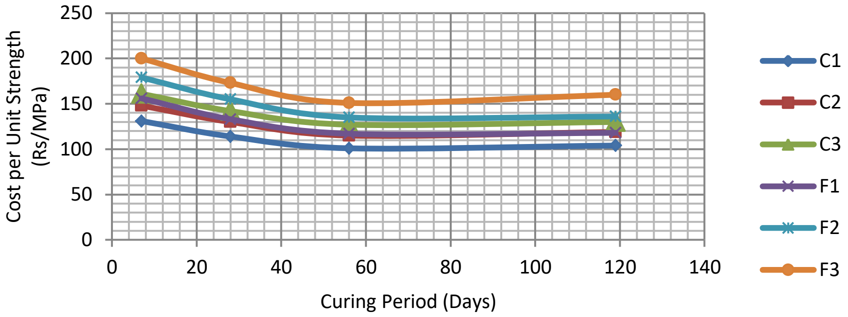

Fig. 6 Cost per Unit Compressive Strength (Rs/MPa) for Different Curing Periods

It is seen that the values of C_A, C_B, and C_C are lower for control concrete (non fiber reinforced concrete) than for fiber reinforced concrete. The cost of glass fiber reinforced concrete is more as compared to non fiber reinforced concrete for gaining of unit strength. Hence water curing is the cheapest method to gain the required strength rather than using additive such as glass fiber. On the other hand cost of C_D is lower for fiber reinforced concrete i.e. the durability cost of fiber reinforced concrete is lower than of non fiber reinforced concrete to survive one year. That means durability cost will go down by using glass fiber as an additive.

Table 6(a) Cost of Different Mix per Unit Strength and Unit Service Life Period

Mix	Cement (Kg/m^3)	Sand (Kg/m^3)	Aggre-gate (Kg/m^3)	Water (Kg/m^3)	Admix-ture (Kg/m^3)	Fiber (Kg/m^3)	Cost (Rs)	C_A (Rs/MPa)	C_B (Rs/MPa)	C_C (Rs/ GPa)	C_D (Rs/ Year)
C1	450	917	959	157	3.4	0	4642.35	114.59	1473.76	79.18	41.31
C2	413	914	956	165	3.1	0	4342.50	129.82	1702.94	81.39	53.32
C3	367	934	977	165	2.75	0	3998.50	141.89	1999.25	89.43	74.82
F1	450	917	959	157	3.4	2.65	6629.85	132.61	1489.85	107.24	23.61
F2	413	914	956	165	3.1	2.65	6330.00	155.22	1758.33	111.79	30.47
F3	367	934	977	165	2.75	2.65	5986.00	173.35	2176.72	124.94	41.22

Table 6(b) Cost of Different Ingredients used in Concrete

Particulars	Cement	Sand	Aggregate	Admixture	Fiber
Rate (Rs/Kg)	6	0.45	0.55	225	750

Note: Rate of water is taken as Rs 240/- (Lump sum Amount) for 28 days curing
C_A: Cost per Unit Compressive Strength (Rs/Mpa) at 28 days curing
C_B: Cost per Unit Flexural Strength (Rs/MPa) at 28 days curing
C_C: Cost per Unit Dynamic Modulus of Elasticity (Rs/ GPa) at 28 days curing
C_D: Cost per Unit service Life Period (Rs/ Year) 28 days curing.

5. CONCLUSION

From the results of the present study the following conclusions can be drawn

1. Compressive strength, flexural strength, electrical resistivity, ultrasonic pulse velocity and modulus of elasticity of concrete are higher at 119 curing days under standard conditions.
2. At 119 days curing electrical resistivity value becomes twice and compressive strength is 1.25 times of 28 days of curing. There is a little change in UPV value from 28 days of curing to 119 days of curing.
3. The rate of change of test results of electrical resistivity, compressive strength and flexural strength is high up to 56 days curing. Hence it is recommended to cure concrete structure at least 56 days continuously by local builders and contractors. Sometimes it is not acceptable to wait 56 days to gain specified concrete strength. However at 28 days curing concrete gains around 80% strength. It is recommended that concrete should be cured for at least 28 days.
4. The time of construction also influences the total cost of construction especially in construction of high rise buildings, bridges and similar structures. Hence 56 days of curing is not always possible, this can only be option in some cases.
5. Addition of 0.1% glass fiber increases the test results of compressive strength, flexural strength, electrical resistivity, ultrasonic pulse velocity and modulus of elasticity by 20%, 42%, 40%, 2% and 5.5% than non fiber reinforced concrete. Also service life period of fiber reinforced concrete is 2.5 times longer than of the non fiber reinforced concrete. But addition of fiber increases the cost of concrete by 30% than non fiber reinforced concrete.
6. The durability of fiber reinforced concrete is higher than non fiber reinforced concrete and does not requir any reaping for a long time. Sometimes repair and maintenance works become essential for a structure.
7. Cost per unit strength of non fiber reinforced concrete is lower than the fiber reinforced concrete at same curing period. Hence it can be concluded that curing is the cheapest method for gaining the strength of concrete.
8. Test results of electrical resistivity and ultra sonic pulse velocity of non fiber reinforced concrete at 28 days curing is near about to equal to 7 days curing of glass fiber reinforced concrete. Addition of fiber in concrete is a laborious process for construction sites without advanced mixtures to avoid fiber balling, achieving homogeneity and making them workable. Hence curing is the easiest method to achieve similar strength and durability of fiber reinforced concrete.

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NEGA BETONA: NAJLAKŠI I EKONOMSKI NAJPOVOLJNIJI METOD POVEĆANJA TRAJNOSTI I ČVRSTOĆE BETONA

Nega betona je process koji sledi neposredno nakon ugradnje i finiširanja betona. Cilj nege je da održi zadovoljavajući sadržaj vlage i temeraturu betona u određenom periodu, tako da može doći do razvoja željenih svojstava. Nega ima velik uticaj na osobine očvrslog betona. Uz odgovarajuću negu, beton postaje jači, neproposniji i otporniji na napone, habanje, smrzavanje i odmrzavanje topljenje. Korišćenje vlakana u betonu može da popravi ove osobine, ali to povećava cenu betona. Ovaj rad saopštava rezultate studije koja je provedena da bi se ocenio uticaj starosti nege na trajnost i čvrstoću betona ojačanog vlaknima i onih bez vlakana. Takođe, data je uporedna analiza koštanja po jedinici čvrstoće i po jedinici perioda eksploatacije betona ojačanih vlaknima, i betona bez vlakana ali sa odgovarajućom negom. Betonske kocke su bile pripremane tako što su varirana tri vodocementna faktora, i tako što su negovane različit broj dana. Sprovedena su ispitivanja električnog otpora, brzine prolaza ultrazvučnog pulsa, čvrstoće na savijanje i dubine karbonacije negovanih kocki. Rezultati testa su pokazali da je propisna nega tradicionalnog betona ekonomičnija od betona ojačanog vlaknima, kada je u pitanju dostizanje istih čvrstoća i trajnosti.

Key Words: *nega, trajnost, čvrstoća, troškovi eksploatacije*.